



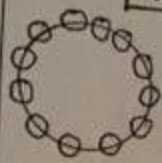
Kidney

المحاضرة الرابعة

Sodium & Glucose
Reabsorption

بتاريخ ٢٧ فبراير ٢٠١٨

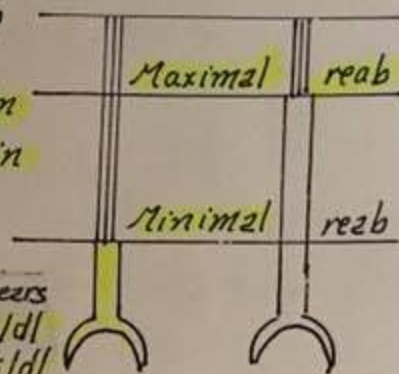
Tubular transport maximum



Substances actively reabsorbed or secreted. require specific transport system (carrier - enzyme) exhibit transport maximum

- T_m limited reabsorption carrier is saturated
e.g. glucose, amino acids,

T_m G ♂ 375 mg/min
♀ 300 mg/min



Renal threshold

Plasma conc. above which substance appears in urine
venous 180 mg/dl
arterial 200 mg/dl

- T_m limited secretion
e.g. PAH, penicillin
Affinity of transport substance for substance is high

Gradient time transport

Substances reabsorbed by diffusion.

DR ∝ conc. gradient × time

Sodium is actively transported. However, in

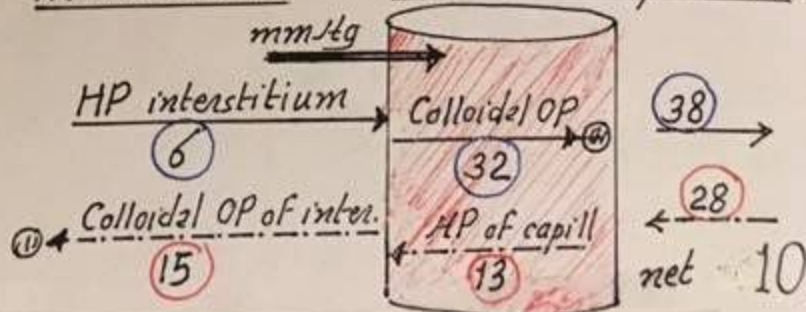
- PCT exhibits gradient time transport.
- DCT & collecting T. " T_m.

Reabsorption by the peritubular capillaries

Cell

interstitium

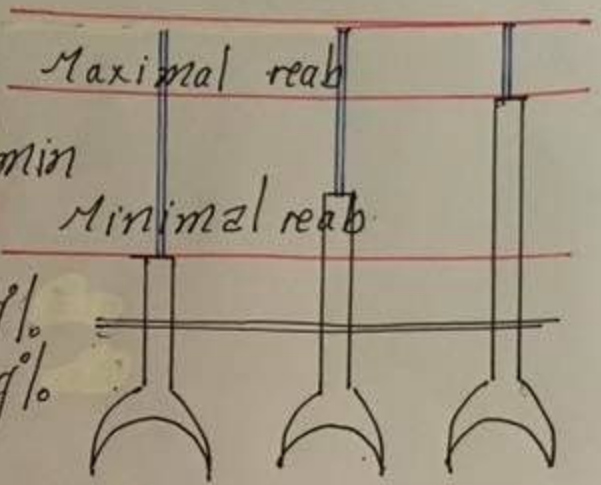
Peritubular capillaries



$$\begin{aligned} \text{Net reabsorptive force} &= (32 + 6) - (13 + 15) \\ &= 38 - 28 \\ &= 10 \text{ mmHg} \end{aligned}$$

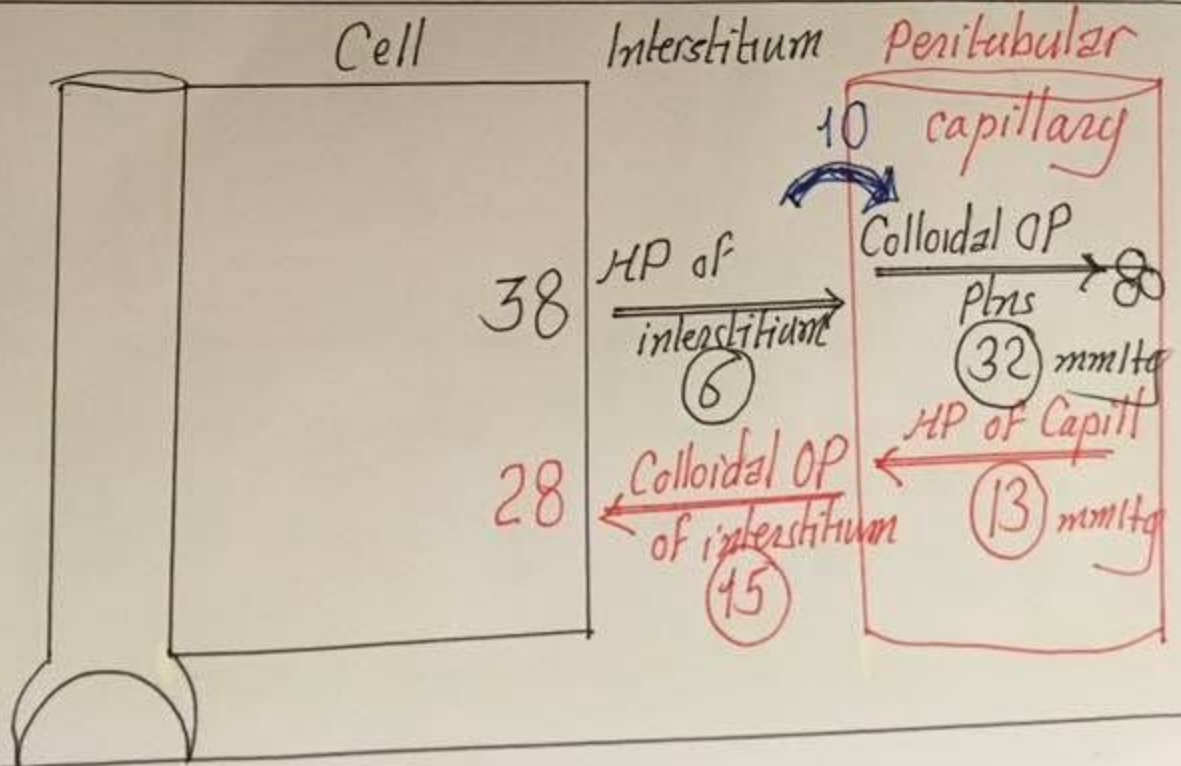
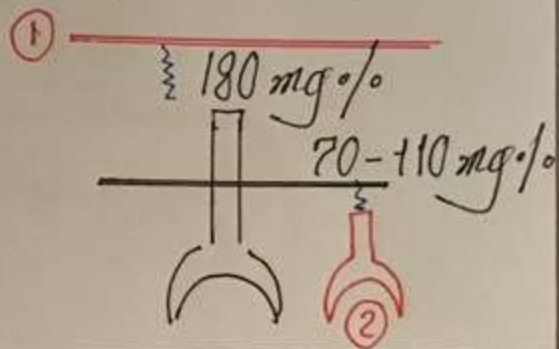
Glucose

- T_{mG}
 ♂ → 375 mg/min
 ♀ 300 mg/min
- Renal threshold
 Venous 180 mg%
 Arterial 200 mg%



Glycosuria

- Fasting bl. Glucose



Proximal tubule

Loop of Henle

Distal tubule

Collecting tubule

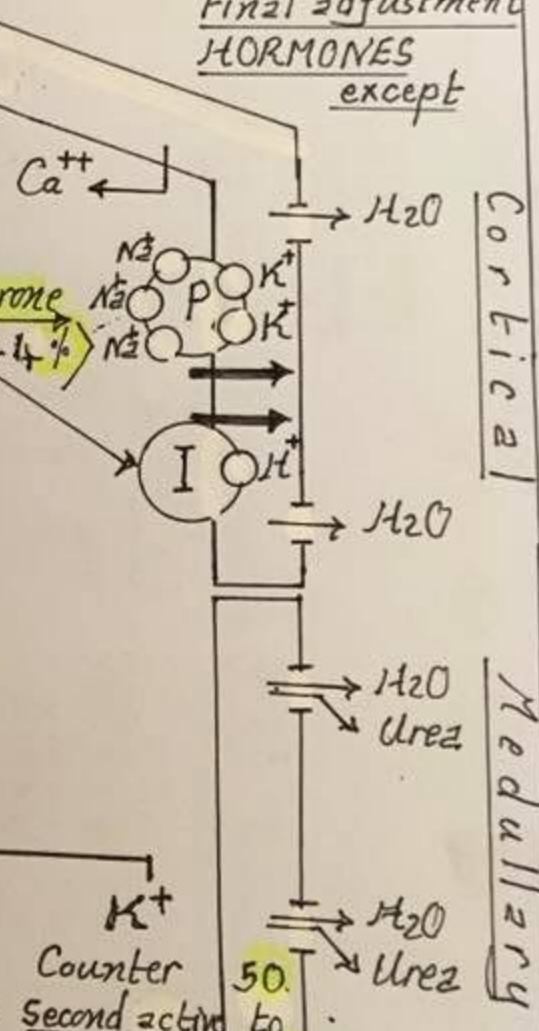
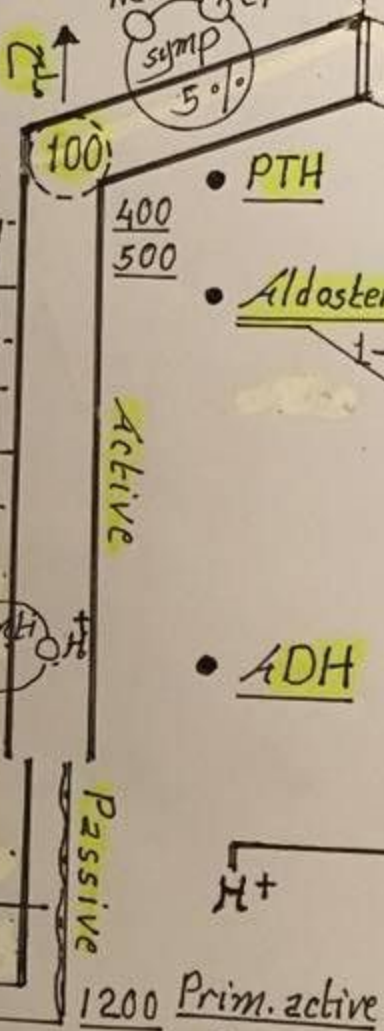
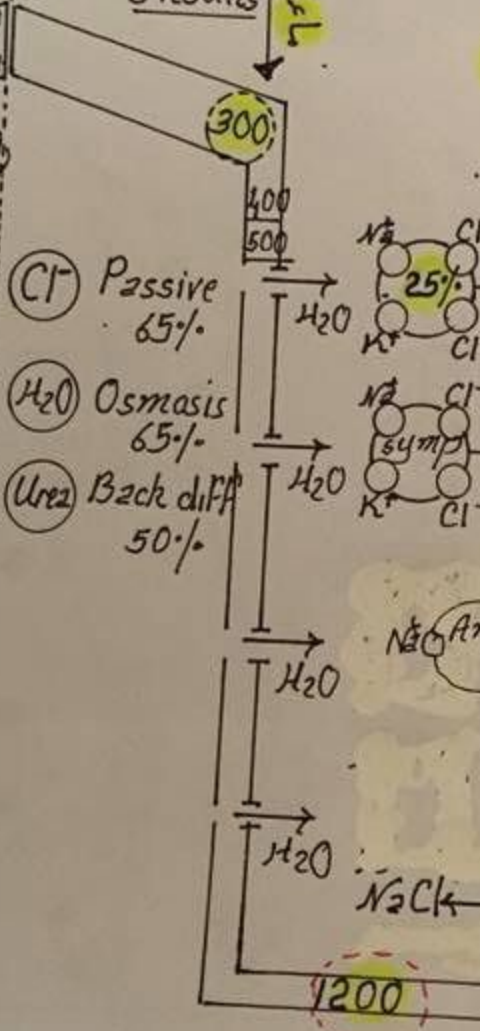
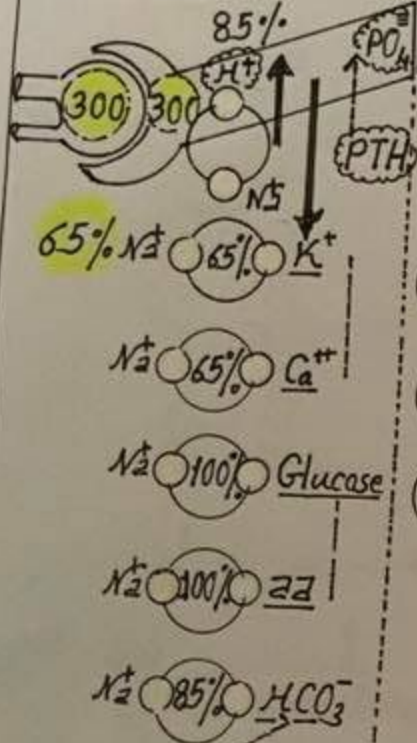
6 results
1st half

2nd half
3 results

early
Na⁺ Cl⁻
symp
5%

late

Final adjustment
HORMONES
except



Counter transport Co
Second active
Secretion Reabsorp

50 to 1200 mosm

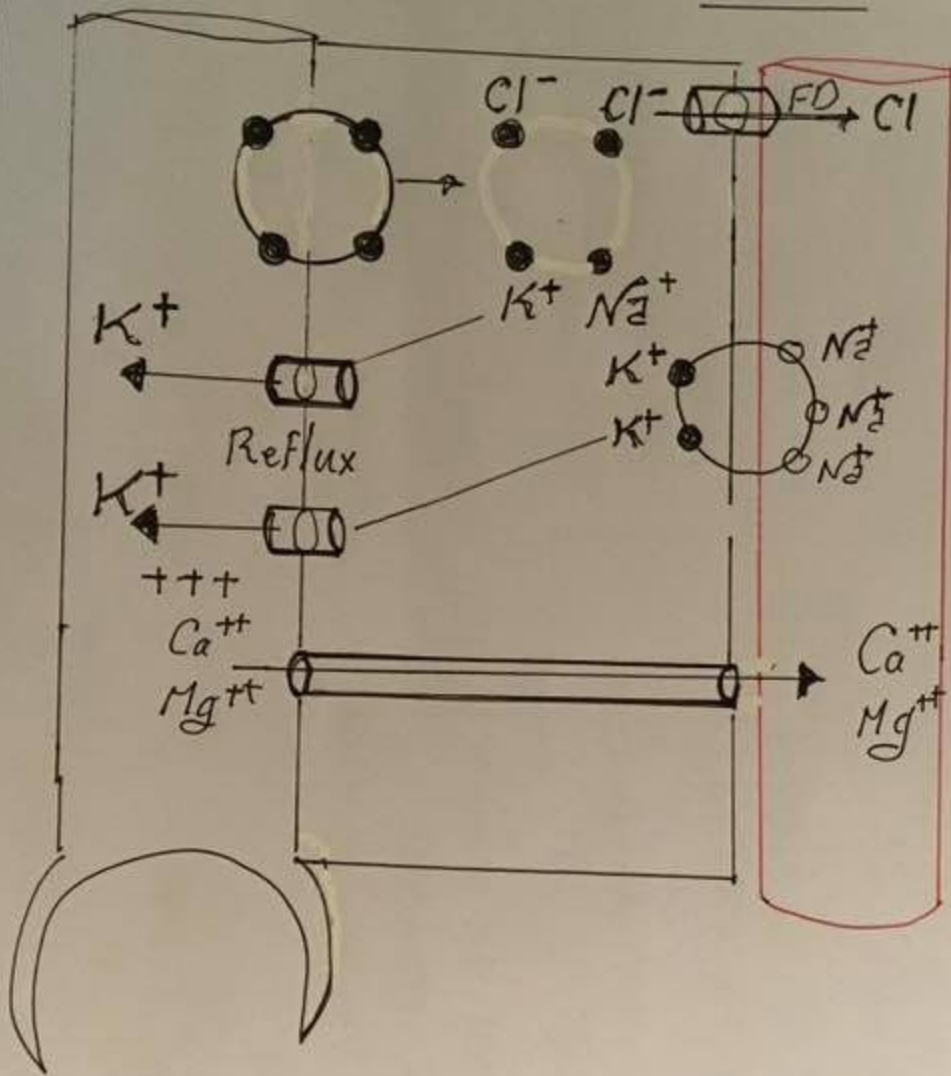
Cortical
Medullary

Apical
lumen

Loop of Henle

Thick ascending

Basolateral



Results

1 Loss Na^- Cl^- & K^+
 Ca^{++} & Mg^{++}

2 Na^+ : increased reab. DCT

» secretion of K^+

» secretion of H^+

i.e. $\downarrow \text{K}^+$
Metabolic alkalosis.
Diuresis \downarrow ABP.

Regulation of Na^+ Excretion

Main factor GFR

1. Glomerulo-tubular balance

++ GFR \rightarrow ++ Na reab

Main site PCT & loop of Henle

Intrinsic mech i.e. not hormonal
tubules reab Constant %

Importance Prevents Na overload of DCT

2. Rate of tubular flow

Slow rate of flow \rightarrow ++ Na reab

3. ABP Pressure natriuresis

++ ABP \rightarrow ++ Na & H_2O excretion

Mech -- Renin \rightarrow II \rightarrow -- aldosterone

Backleak of Na^+ in lumen.

4. Symp stim. - ++ Na reabsorption

-- GFR \rightarrow -- Na excretion i.e. »

++ Renin \rightarrow ++ Angiotensin II

5. Diuretics ++ Na excretion (discussed later)

6. Hormones

(++) Na reabsorption

Angiotensin II

most powerful

Mineralocorticoids

Glucocorticoids

weak action

Estrogens

(--)

ANP

++ GFR

(VD aff
VC eff)

-- Renin

relax
mesenteric cells

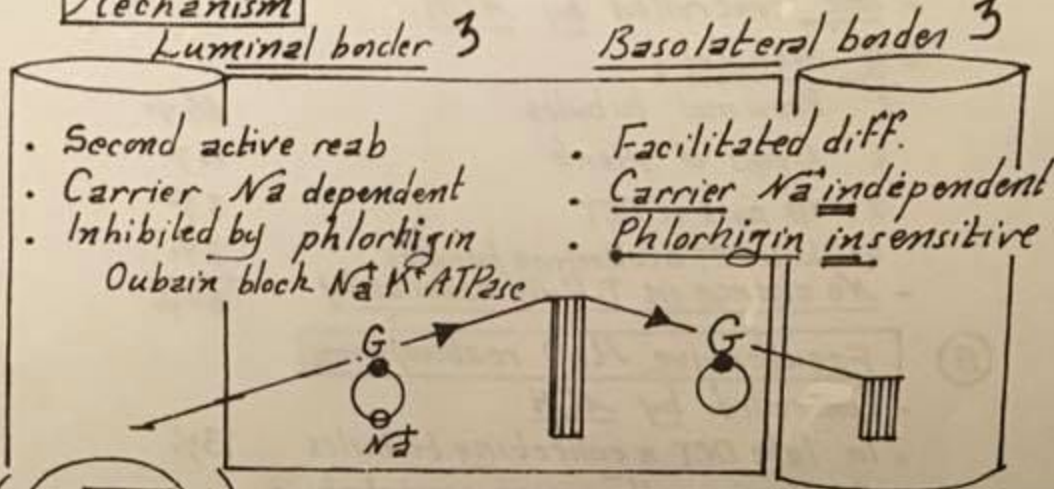
Endothelins

E PGE₂

Glucose reabsorption 4 x 3

- 3 - Completely reabsorbed only few mg in urine/24 H
- Early portion of PCT
- Secondary active reab. (cotransport with Na^+)

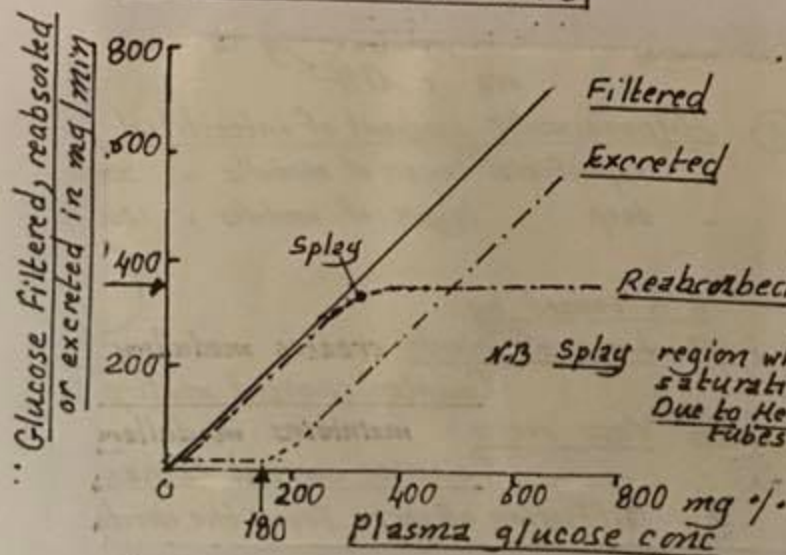
Mechanism



Tmg

Fasting G level 70-110 mg/dl
 Renal Threshold Arterial 200 Venous 180 mg/dl
 TmG ♂ 375 ♀ 300 mg/minute
 It depends on carrier transport system

Glucose titration curve



Fasting bl. glucose mg/dl		
< 200	200-300	> 300
+	++	+++
No	Some	All above TmG excreted
All	gradual ++	max no ++

*B Splay region where reab gradually reaching saturation between R-threshold & TmG
 Due to heterogeneity of TmG in different Fabes

Glycosuria

- Diabetes mellitus ++ Fasting glucose level
- Renal glycosuria -- renal threshold.

Congenital defect in G transport system TmG is also decreased
 Result osmotic diuresis & loss of Na^+ & K^+ in urine

Glucose titration curve and T_m

The curve shows relation between plasma glucose concentration and filtration load, reabsorption & excretion rate of glucose. Plasma glucose conc. is increased by infusion of glucose.

Curve is best understood by :

Study of each relation (3) separately then studying all relations together

- Filtration load = $GFR \times [P]_{\text{glucose}}$

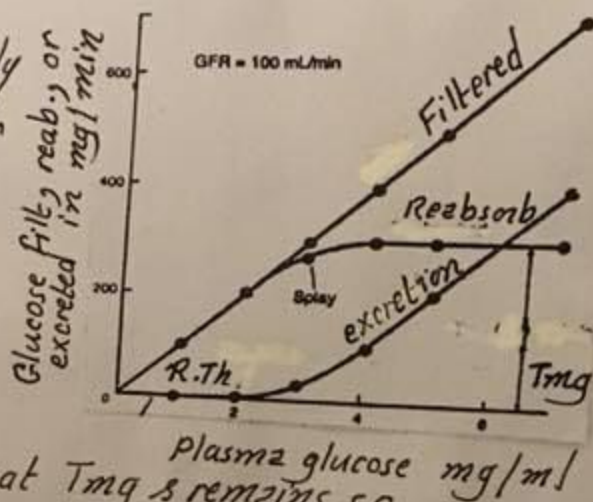
It ++ linearly with ++ plasma

- Reabsorption ++ gradually to renal threshold, then bend at

splay, then reaches its maximum at T_m & remains so.

Explanation: Gradual saturation of glucose carriers in different nephrons. At T_m all glucose carriers are saturated.

- Excretion Starts at renal threshold, then ++ slightly as some glucose is not excreted (reabsorbed), then ++ markedly & linearly paralleling that of filtration at T_m and above this plasma level.



	up to R threshold	200 to 300 mg dl	Above T_m
<u>Filtered load</u>	+	++	+++
<u>Reabsorption</u>	++ linear to Filt.	Splay (bend)	no further increase
<u>Excretion</u>	no excretion	+	++ linear to Filt

تم غلق القناة الرئيسية من اليوتيوب
انشر في القناة الجديدة
لتصلك المحاضرات ورياجرامات 2018



رابط المحاضرة على اليوتيوب
اضغط هنا

<https://youtu.be/fK0oBIHC2M8>